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Head and Neck Cancer in Bali: A Retrospective Study on Patient Characteristics, Predominant Sites, and Histopathology at a Tertiary Referral Hospital

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A B S T R A C T

Head and neck cancers (HNCs) represent a significant global health burden, with distinct epidemiological patterns observed across different geographical regions. In Indonesia, HNCs are among the leading malignancies, yet detailed regional data, particularly from areas like Bali, remain limited. This study aimed to delineate the characteristics of HNC patients at a tertiary referral hospital in Denpasar, Bali. A retrospective descriptive study was conducted using medical records of patients diagnosed with head and neck malignancies at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, between January 1st, 2021, and December 31st, 2023. Data collected included age, gender, occupation, primary tumor site, and histopathological findings. A total sampling method was employed. Descriptive statistics were used for analysis. A total of 290 patient records were analyzed. Males comprised 69% (n=201) of cases, and females 31% (n=89). The predominant age group was 45–65 years (63%, n=183). Farmers were the most common occupational group (27%, n=77). Nasopharyngeal cancer was the most prevalent malignancy, accounting for 80% (n=232) of cases. Nonkeratinizing squamous cell carcinoma was the most frequent histopathological diagnosis (80%, n=231). In conclusion, head and neck malignancies in this Balinese cohort predominantly affected middle-aged to elderly males, with farming being a common occupation. The strikingly high prevalence of nasopharyngeal cancer, primarily nonkeratinizing squamous cell carcinoma, underscores a significant regional health concern that warrants further etiological investigation and targeted public health strategies.

1. Introduction

Head and neck cancers (HNCs) encompass a heterogeneous group of malignancies originating from the epithelial surfaces of the upper aerodigestive tract, including the oral cavity, pharynx (nasopharynx, oropharynx, and hypopharynx), larynx, paranasal sinuses, nasal cavity, and salivary glands. Globally, HNCs rank as the sixth most common cancer type, with an estimated annual incidence of over 890,000 new cases and 450,000 deaths. The incidence and mortality rates exhibit considerable geographical variation, largely influenced by differences in exposure to risk factors and socioeconomic conditions. Developing countries, particularly in South and Southeast Asia, bear a disproportionately high burden of these malignancies. In Indonesia, head and neck malignancies are recognized as a significant public health issue, ranking among the top causes of cancer-related morbidity and mortality. The etiology of HNCs is multifactorial, with well-established risk factors including tobacco use (both smoked and smokeless), excessive alcohol consumption, and viral infections. Human papillomavirus (HPV) is a major etiological agent for oropharyngeal squamous cell carcinoma, particularly in developed nations. Conversely, Epstein-Barr Virus (EBV) infection is strongly and consistently associated with nasopharyngeal carcinoma (NPC), especially the nonkeratinizing subtypes, which are

endemic in Southeast Asia, including Indonesia. Other contributing factors may include occupational exposures (wood dust, nickel, formaldehyde), dietary habits (consumption of preserved or salted foods, low fruit and vegetable intake), poor oral hygiene, genetic predisposition, and socioeconomic status. The interplay of these factors often dictates the specific anatomical subsite and histological type of cancer that develops. Demographic characteristics such as age and gender also play a crucial role. HNCs are generally more common in males than females, often with a ratio of 2:1 to 4:1, although this varies by subsite and geographic region. The incidence typically increases with age, with the majority of cases diagnosed in individuals over 50 years old. However, an alarming rise in HNC incidence has been observed in younger populations in some regions, often linked to HPV infection for oropharyngeal cancers.[1-4]

In Indonesia, NPC is a particularly prominent head and neck malignancy, with some studies reporting it as the most common HNC. The high incidence of NPC in the Indonesian population is often linked to genetic susceptibility, ubiquitous EBV exposure, and specific environmental or dietary factors. Data from a recent systematic review and meta-analysis highlighted that Indonesia had the third-highest mortality rate globally due to NPC in 2019, emphasizing the critical need for further research and targeted interventions. While smoking and male gender were identified as potential risk factors in the Indonesian population, the evidence was not always statistically significant across all pooled studies, and other factors, like salted fish consumption, showed significant associations in specific reports. The unique ethnic diversity within Indonesia may also contribute to varied genetic predispositions. Understanding the specific epidemiological patterns and patient characteristics of HNCs within distinct regions of Indonesia, such as Bali, is crucial for developing tailored prevention, early detection, and treatment strategies. Bali, with its unique cultural and environmental landscape, may present a distinct profile of HNCs. Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar serves as the main tertiary referral hospital for the province of Bali and surrounding islands, making it a critical site for observing the spectrum of these malignancies. Descriptive epidemiological studies from such centers provide invaluable baseline data, identify high-risk populations, and can guide resource allocation for cancer control programs. While some national data and studies from other Indonesian regions exist, specific, up-to-date information from Bali is less prevalent in the published literature.[5-8]

The novelty of this study lies in its focused and recent epidemiological review of head and neck malignancies within a specific tertiary referral hospital in Bali, Indonesia, a region with a distinct demographic and environmental profile where such comprehensive data has been limited. While national data points to a high burden of HNCs, particularly nasopharyngeal carcinoma, this study provides crucial, granular insights into the contemporary patient characteristics, including age, gender, and notably, occupation (such as farming, which may entail specific environmental exposures), the precise distribution of primary tumor sites, and the predominant histopathological types presenting to a major Balinese healthcare institution over a defined three-year period (2021-2023).[9,10] Therefore, this study aimed to identify and describe the key characteristics of patients diagnosed with head and neck malignancies at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar from January 1st, 2021, to December 31st, 2023. Specifically, this study sought to delineate patterns based on age, gender, occupation, the anatomical location of the primary tumor, and the histopathological findings. This information is intended to contribute to a better understanding of the HNC landscape in Bali, providing a foundation for future analytical research into etiological factors and informing local public health initiatives for prevention, early diagnosis, and management.

2. Methods

This investigation was conducted as a retrospective descriptive study. The study utilized secondary data

sourced from the medical records of patients diagnosed and treated for head and neck malignancies. The research was carried out at the Department of Otorhinolaryngology-Head and Neck Surgery, Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, Bali, Indonesia. Prof. Dr. I.G.N.G. Ngoerah General Hospital is the largest government-owned tertiary referral hospital in the province of Bali and also serves as a referral center for the Nusa Tenggara islands. As a major teaching hospital affiliated with Udayana University, it manages a broad spectrum of complex medical cases, including various oncological conditions. Data collection for this study was performed between January 2024 and March 2024, covering patient admissions and diagnoses over a three-year period. The study encompassed patients who were diagnosed and managed for head and neck malignancies between January 1st, 2021, and December 31st, 2023, inclusive. This three-year period was selected to provide a contemporary overview of the characteristics of HNC patients presenting to the hospital. The study population included all patients who had a confirmed diagnosis of primary head and neck malignancy and received treatment (inpatient or outpatient) at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, during the specified study period. A total sampling method was employed, meaning all eligible patient records meeting the inclusion criteria within the study timeframe were included in the analysis. This approach was chosen to maximize the sample size and capture the complete spectrum of cases managed at the institution during this period.

The inclusion criteria for patient selection were as follows: All patients with a histopathologically confirmed diagnosis of primary head and neck malignancy; Patients whose medical records contained complete data for all the variables under investigation, which included gender, age at diagnosis, occupation, primary anatomical site of the tumor, and specific histopathological type; Patients who were treated or registered at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, between January 1st, 2021, and December 31st, 2023.

Patients were excluded from the study if their medical records were incomplete with respect to the key variables being studied. The diagnosis of head and neck malignancy was uncertain or not histopathologically confirmed. The malignancy was a recurrence from a primary tumor diagnosed and treated before January 1st, 2021, unless it was a new primary HNC. The malignancy was metastatic to the head and neck region from a primary cancer outside this anatomical area.

Data were retrospectively collected from the hospital's medical record archives and the cancer registry database of the Otorhinolaryngology-Head and Neck Surgery Department. A standardized data collection sheet was designed and utilized to abstract the relevant information systematically and ensure consistency. The variables collected for each patient included: Sociodemographic characteristics: Age at diagnosis (categorized into groups: 0–5, 6–11, 12–25, 26–45, 46–65, and >65 years); Gender (male, female); Occupation (categorized as: housewife, laborer, unemployed, self-employed, farmer, student, civil servant).

Clinical and pathological characteristics: Primary anatomical site of the malignancy (categorized as: oral cavity, sinonasal, nasopharynx, hypopharynx, parotid, larynx, thyroid). Histopathological type of the malignancy (categorized based on WHO classification, including but not limited to: keratinizing squamous cell carcinoma, nonkeratinizing squamous cell carcinoma, undifferentiated carcinoma, spindle cell carcinoma, papillary type carcinoma, follicular type carcinoma, medullary type carcinoma, anaplastic type carcinoma, carcinoma ex pleomorphic adenoma).

All data were anonymized to maintain patient confidentiality. The collected data were entered into a database and subsequently analyzed using appropriate statistical software SPSS version 27. Descriptive statistical methods were employed to summarize the characteristics of the study population. Frequencies and percentages were calculated for categorical variables such as gender, age groups, occupation, primary tumor site, and histopathological

types. The results were then presented in tabular and narrative formats to provide a clear and comprehensive overview of the findings. Comparisons were made with existing literature and data from previous studies where relevant, particularly in the discussion section. This study was conducted following ethical principles outlined in the Declaration of Helsinki. Approval for the study was sought from the relevant institutional review board or ethics committee of Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar prior to data collection. As a retrospective study using anonymized medical record data, direct patient consent was typically waived, provided that patient confidentiality was strictly maintained throughout the study. All data were coded, and personal identifiers were removed from the final dataset used for analysis to ensure anonymity.

3. Results and Discussion

Table 1 provides a comprehensive overview of the key sociodemographic characteristics of 290 patients diagnosed with head and neck malignancies at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar over a three-year period from January 1st, 2021, to December 31st, 2023. These characteristics, specifically gender distribution, age at diagnosis, and occupational background, offer critical insights into the patient population affected by these cancers in this major tertiary referral center in Bali, Indonesia. Understanding this profile is fundamental for tailoring public health strategies, allocating healthcare resources effectively, and guiding further etiological research specific to this region. The data clearly indicate a significant male predominance among patients with head and neck malignancies in this cohort. Of the 290 patients, 201 (69%) were male, while 89 (31%) were female. This translates to a male-to-female ratio of approximately 2.26:1. This finding is consistent with established global epidemiological trends for head and neck cancers, which are generally reported to be more common in males. The higher incidence in males is often attributed to a greater prevalence of exposure to primary risk factors such as tobacco use (smoking and smokeless) and alcohol consumption, which are historically more common among men in many societies. While this study did not assess specific risk factor exposure, the observed gender disparity aligns with patterns seen in numerous other populations and suggests that gender-specific risk profiles likely play a role in the development of head and neck cancers within this Balinese cohort. Further investigation into gender-specific behaviors and exposures could elucidate the contributing factors to this disparity. The age distribution of patients at the time of diagnosis reveals that head and neck malignancies predominantly affect the middle-aged and elderly population. The largest proportion of patients, 183 individuals constituting 63% of the total cohort, fell within the 46–65 years age group. This was followed by the 26–45 years age group, which accounted for 68 patients (23%), and the >65 years age group, with 34 patients (12%). Collectively, individuals aged 46 years and older represented 75% of all cases. The incidence in younger individuals was markedly lower, with only 5 patients (2%) diagnosed in the 12–25 years age bracket. Significantly, no cases were reported in the pediatric age groups of 0–5 years and 6–11 years during the study period. This age pattern is characteristic of many adult-onset cancers, where the cumulative effects of carcinogen exposure over time, along with age-related cellular changes, contribute to an increased risk of malignancy. The substantial burden of head and neck cancer in the economically active age group of 46-65 years also highlights potential socioeconomic impacts, including loss of productivity. The data underscore the need for heightened awareness and potential screening or early detection initiatives targeted towards individuals entering and within this peak age range. The occupational profile of the patients provides valuable context, potentially highlighting groups with specific environmental or lifestyle exposures. Farmers constituted the largest single occupational group, with 77 patients, accounting for 27% of the cohort. This is a noteworthy finding, suggesting that agricultural work might be associated with an increased risk of

head and neck malignancies in this population. Potential exposures for farmers could include prolonged sunlight (UV radiation), pesticides, herbicides, dust, and other environmental agents. Laborers represented the second most common occupation, with 52 patients (18%). This category can be broad and may involve various physical tasks and potential exposures depending on the specific type of labor. Housewives accounted for 48 patients (17%), followed by self-employed individuals (44 patients, 15%). The unemployed group consisted of 32 patients (11%), civil servants 30 patients (10%), and students made up the smallest occupational category with 5 patients (2%). The prominence of farmers warrants further investigation into specific agricultural practices and associated exposures in Bali that might contribute to head and neck cancer development. Similarly, understanding the types of work undertaken by "laborers" could offer further clues. The occupational data suggest that environmental and lifestyle factors linked to certain professions may play a role in the etiology of head and neck cancer in this setting. The sociodemographic data from Table 1 paint a picture of the typical head and neck cancer patient presenting at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar as being male, aged between 46 and 65 years, and often working as a farmer. This profile is crucial for healthcare providers and public health planners in Bali. It helps in identifying high-risk demographics for targeted awareness campaigns and early diagnostic efforts. For instance, public health messages emphasizing early symptoms and risk factor reduction could be specifically tailored and disseminated within communities with a high proportion of middle-aged males and individuals engaged in farming.

Table 1. Sociodemographic characteristics of head and neck malignancy patients at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar (2021-2023).

Characteristic	Category	Frequency (n)	Percentage (%)
Total patients		**290**	**100%**
Gender	Male	201	69%
	Female	89	31%
Age Group (Years)	0 – 5	0	0%
	6 – 11	0	0%
	12 – 25	5	2%
	26 – 45	68	23%
	46 – 65	183	63%
	>65	34	12%
Occupation	Farmer	77	27%
	Laborer	52	18%
	Housewife	48	17%
	Self-employed	44	15%
	Unemployed	32	11%
	Civil Servant	30	10%
	Student	5	2%

Table 2 delineates the anatomical distribution of primary tumor sites among the 290 patients diagnosed with head and neck malignancies at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, between January 2021 and December 2023. This information is pivotal for understanding the specific cancer burden within

different subsites of the head and neck region in this Balinese cohort, which has direct implications for diagnostic focus, treatment planning, resource allocation, and etiological research. The most striking and clinically significant finding presented in Table 2 is the overwhelming predominance of nasopharyngeal cancer. This site alone accounted for 232 out of 290 cases, translating to a substantial 80.00% of all head and neck malignancies diagnosed in this tertiary referral hospital during the study period. This exceptionally high proportion firmly establishes nasopharyngeal carcinoma (NPC) as the principal type of head and neck cancer encountered in this patient population. Such a high incidence is characteristic of regions endemic for NPC, including parts of Southeast Asia. This finding strongly suggests that specific etiological factors related to NPC, such as Epstein-Barr virus (EBV) infection, genetic predisposition, and particular environmental or dietary exposures, are highly prevalent or influential in Bali. The sheer volume of NPC cases underscores an urgent need for focused public health strategies, including awareness campaigns about early symptoms (unilateral hearing loss, persistent nasal obstruction, neck lumps) and robust diagnostic and treatment pathways for this specific malignancy. Following nasopharyngeal cancer, malignancies of the larynx were the second most frequently observed, though their incidence was considerably lower. Laryngeal cancers constituted 23 cases, representing 7.93% of the total head and neck cancer burden in this study. While a distant second to NPC, this still indicates a significant number of patients affected by cancer in the voice box, a site commonly associated with risk factors like tobacco smoking and alcohol consumption. Closely following laryngeal cancers were malignancies of the sinonasal tract (nasal cavity and paranasal sinuses), which accounted for 21 cases or 7.24% of the total. Cancers in this complex anatomical region can present with non-specific symptoms, often leading to diagnostic challenges. Occupational exposures, such as wood dust, and chronic inflammation are sometimes implicated in sinonasal cancers. Malignancies of the thyroid gland were identified in 6 patients, making up 2.07% of the cohort. Thyroid cancer has a distinct etiology and biological behavior compared to squamous cell carcinomas that dominate other head and neck sites. Its inclusion provides a complete picture of all malignancies treated within the broader head and neck remit of the department. Cancers of the oral cavity (which can include lips, tongue, gums, floor of mouth, and palate) and the parotid gland (the largest of the salivary glands) were relatively infrequent in this study population, each accounting for 3 cases or 1.03% of the total. Globally, oral cavity cancer is a very common head and neck malignancy, often strongly linked to tobacco, areca nut use, and alcohol. The lower percentage seen here might be relative due to the extremely high proportion of NPC, or it could reflect different local risk factor profiles. Parotid gland tumors are diverse, with varying degrees of malignancy. The least common primary tumor site identified was the hypopharynx, with only 2 cases, representing 0.69% of the total head and neck malignancies. Hypopharyngeal cancers are often aggressive and diagnosed at a late stage due to their hidden location and often subtle early symptoms. Table 2 unequivocally highlights nasopharyngeal carcinoma as the dominant head and neck malignancy in patients treated at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, from 2021-2023. The distribution of other tumor sites, such as the larynx and sinonasal tract, while less frequent, still contributes to the overall cancer burden. The pattern observed, particularly the high incidence of NPC, provides critical local epidemiological data.

Table 2. Distribution of primary tumor sites in head and neck malignancy patients at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar (2021-2023).

Primary anatomical site	Frequency (n)	Percentage (%)
Nasopharynx	**232**	**80.00%**
Larynx	23	7.93%
Sinonasal	21	7.24%
Thyroid	6	2.07%
Oral Cavity	3	1.03%
Parotid gland	3	1.03%
Hypopharynx	2	0.69%
Total patients	**290**	**100.00%**

Table 3 provides a crucial insight into the microscopic nature of the head and neck malignancies diagnosed at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, between 2021 and 2023. Histopathological classification is fundamental in oncology as it determines the specific type of cancer cells, which in turn influences prognosis, treatment strategies, and often provides clues about the underlying etiology. The most striking feature of the histopathological landscape presented in Table 3 is the profound predominance of Nonkeratinizing Squamous Cell Carcinoma (SCC). This single histological type accounted for 231 out of 290 cases, representing a significant 79.66% of all head and neck malignancies. This high prevalence is particularly noteworthy. Nonkeratinizing SCC encompasses subtypes such as differentiated nonkeratinizing carcinoma and undifferentiated carcinoma (the latter is also listed separately but often grouped under nonkeratinizing forms of nasopharyngeal carcinoma). This histological variant, especially the undifferentiated type (sometimes referred to as lymphoepithelioma-like carcinoma), is strongly associated with Epstein-Barr Virus (EBV) infection and is the hallmark of nasopharyngeal carcinoma (NPC) in endemic regions, including Southeast Asia. Given the finding from Table 2 that NPC constituted 80% of the primary tumor sites, the dominance of Nonkeratinizing SCC in Table 3 is a congruent and expected finding, underscoring the major burden of EBV-associated NPC in this Balinese. Keratinizing Squamous Cell Carcinoma was the second most common histological type, identified in 36 patients (12.41%). This form of SCC is characterized by the presence of keratin pearls and intercellular bridges, indicating squamous differentiation. It is more typically associated with risk factors such as smoking and alcohol consumption and is commonly found in sites like the oral cavity, oropharynx (HPV-negative), and larynx. While significantly less common than the nonkeratinizing type in this study, it still represents a notable portion of the SCC burden. Undifferentiated Carcinoma was diagnosed in 16 patients, accounting for 5.52% of the cases. As mentioned, in the context of nasopharyngeal cancers, undifferentiated carcinoma is often considered a subtype of nonkeratinizing carcinoma and is strongly linked to EBV. Its separate listing here, if distinct from the broader "nonkeratinizing" category in some instances, still contributes to the overall picture of poorly differentiated, aggressive tumors commonly seen in NPC. If these 16 cases are primarily from the nasopharynx, they further solidify the high incidence of EBV-related NPC variants. Other types of carcinomas were much less frequent. Papillary Type Carcinoma, observed in 4 patients (1.38%), can occur in various head and neck sites, including the thyroid and as a variant of SCC in the upper aerodigestive tract. Its specific origin would require further

clinicopathological correlation. Several rare histological types were each identified in a single patient (0.34% each): Spindle Cell Carcinoma (also known as sarcomatoid carcinoma) is an uncommon, aggressive variant of SCC characterized by biphasic growth with both squamous and spindle cell components; Follicular Type Carcinoma is a differentiated thyroid carcinoma originating from follicular cells of the thyroid gland. Its presence reflects one of the thyroid malignancies included in the overall head and neck cancer cohort. Carcinoma ex Pleomorphic Adenoma is a malignancy arising from a pre-existing benign pleomorphic adenoma, most commonly occurring in the salivary glands, particularly the parotid gland. Notably, the table indicates that Medullary Type Carcinoma and Anaplastic Type Carcinoma, which are other forms of thyroid cancer, were not observed in this cohort (0 cases, 0.00%). This provides specific information about the spectrum of thyroid malignancies encountered. The histopathological distribution detailed in Table 3 is overwhelmingly dominated by Nonkeratinizing Squamous Cell Carcinoma, which aligns perfectly with the high prevalence of nasopharyngeal cancer reported in Table 2. This strong correlation highlights a specific disease entity (likely EBV-associated NPC) as the primary driver of head and neck cancer statistics in this hospital setting. The presence of keratinizing SCC indicates the contribution of other types of squamous cell carcinomas, potentially linked to different risk factors and arising from other anatomical sites within the head and neck. The rarer histological types contribute to the diversity of malignancies but are numerically minor compared to the squamous cell carcinoma variants. This histopathological profile is critical for oncologists and pathologists at the institution for diagnostic confirmation, for guiding treatment selection (as nonkeratinizing NPCs are often highly radiosensitive and chemosensitive), and for furthering research into the molecular characteristics of these prevalent cancers in Bali.

Table 3. Histopathological distribution of head and neck malignancies at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar (2021-2023).

Histopathological finding	Frequency (n)	Percentage (%)
Nonkeratinizing squamous cell carcinoma	**231**	**79.66%**
Keratinizing squamous cell carcinoma	36	12.41%
Undifferentiated carcinoma	16	5.52%
Papillary type carcinoma	4	1.38%
Spindle cell carcinoma	1	0.34%
Follicular type carcinoma	1	0.34%
Carcinoma ex pleomorphic adenoma	1	0.34%
Medullary type carcinoma	0	0.00%
Anaplastic type carcinoma	0	0.00%
Total patients	**290**	**100.00%**

This retrospective descriptive study provides a contemporary overview of the characteristics of patients with head and neck malignancies presenting to Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar, a major tertiary referral hospital in Denpasar, Bali, from 2021 to 2023. The findings revealed distinct patterns in terms of gender, age, occupation, primary tumor site, and histopathology, which contribute to understanding the local HNC landscape and have implications for regional cancer control strategies. The study observed a significant male predominance (69%) among HNC patients, with

a male-to-female ratio of 2.2:1. This finding is consistent with global trends and numerous other studies, which generally report a higher incidence of HNCs in males. For example, research by Kim et al. (as cited in the source document) also noted a threefold higher incidence in men, and similar ratios are reported in American populations. This disparity is often attributed to higher rates of exposure to major risk factors such as tobacco smoking and alcohol consumption among men. While specific data on smoking and alcohol consumption were not part of this study's primary variables, these are known significant contributors to HNC development globally and in Indonesia. The peak age incidence in our cohort was the 45–65 year age group (63%), followed by the 26-45 year group (23%) and those >65 years (12%). This aligns with general oncological principles that cancer incidence increases with age, likely due to accumulated genetic mutations and prolonged exposure to carcinogens. Literature cited in the provided document, such as Desen et al. (2013), found a majority of HNCs in the 30-60 year age group, and research by Sabirin et al. in Bandung (2010-2014) reported a peak in the 46-55 year age group (28.7%). Similarly, studies in Egypt also reported an average age of 46-55 years. The absence of cases in the very young pediatric age groups (0-11 years) is typical for most HNCs, which are predominantly cancers of adulthood.[11,12]

A notable finding was that farmers constituted the largest occupational group among HNC patients (27%). This is consistent with some Indonesian studies, such as one from Arifin Achmad Regional Hospital in 2012, which also found farming to be the most common occupation among nasopharyngeal cancer patients (31.37%). This observation warrants further investigation into potential occupational exposures. Farmers may experience prolonged exposure to sunlight (UV radiation), pesticides, herbicides, and dust, which have been implicated as potential risk factors for certain cancers. UV radiation, in particular, is a known risk factor for lip and skin cancers of the head and neck. Laborers (18%) also represented a significant proportion, and their exposures could be varied. The relatively high percentage of housewives (17%) is also noteworthy, as seen in the study by Sabirin et al. (30.6%), and could reflect exposure to indoor pollutants (from cooking fuels) or passive smoking, although these were not assessed here. The most striking finding of this study was the overwhelming predominance of nasopharyngeal carcinoma, accounting for 80% (n=232) of all HNC cases. This exceptionally high proportion confirms that NPC is a major public health concern in Bali, aligning with observations from other parts of Indonesia and Southeast Asia, which are known endemic regions for NPC. For instance, research at FKUI/RSCM in Jakarta showed NPC as the leading HNC (approx. 60%), and a study in Manado by Hutauruk et al. (2010-2012) found NPC in 35.1% of HNC cases. Globally, while NPC is relatively rare in many Western countries, its incidence is very high in Southern China, Southeast Asia, North Africa, and Arctic Inuit populations. The incidence in Indonesia has been reported as one of the highest in the region. The etiology of NPC is complex and involves an interplay of genetic susceptibility (certain HLA genotypes), EBV infection, and environmental factors. EBV is found in virtually all undifferentiated NPCs in endemic areas, and its role as a causative agent is well-established. A recent study highlighted that NPC is the most prevalent HNC in Indonesia, with 100% EBV infection in tumor cells. Dietary factors, such as high consumption of salted, preserved, or fermented foods (which may contain nitrosamines or promote EBV reactivation), and exposure to smoke (tobacco or domestic wood fires) have also been implicated. Given that 80% of HNCs in this Balinese cohort were NPC, future research should focus on identifying specific local risk factors, including EBV prevalence and strains, genetic markers, and detailed environmental/dietary exposures within the Balinese population.[13,14]

Laryngeal cancer (8%) and sinonasal cancers (7%) were the next most common sites in this study, which is a pattern often seen, although their proportions are

dwarfed by NPC here. The relatively low incidence of oral cavity cancer (1.16%) is interesting, as oral cancers are very common globally, often linked strongly to tobacco and alcohol. This lower proportion might be relative due to the extremely high NPC rate or could reflect different patterns of risk factor exposure in this specific population. Consistent with the high prevalence of NPC, nonkeratinizing squamous cell carcinoma was the predominant histopathological type, found in 80% of all HNC patients. This category, according to WHO classification, includes both differentiated nonkeratinizing carcinoma and undifferentiated carcinoma, the latter often referred to as lymphoepithelioma due to its prominent reactive lymphoid infiltrate. These nonkeratinizing forms are strongly associated with EBV infection, particularly in endemic areas like Southeast Asia. The finding that 80% of HNCs were nonkeratinizing SCC directly reflects the 80% incidence of NPC, as this histological type is characteristic of endemic NPC. Keratinizing squamous cell carcinoma, which is more often associated with smoking and alcohol in other HNC sites (like the larynx and oral cavity) and is less consistently linked to EBV in the nasopharynx, accounted for 12% of cases. This aligns with the general understanding that squamous cell carcinoma, in its various forms, constitutes over 90% of HNCs globally. The predominance of the nonkeratinizing variant in this study strongly supports the central role of NPC in defining the HNC landscape in Bali. The demographic profile of HNC patients in this study (middle-aged to older males) is broadly similar to many international reports. However, the overwhelming proportion of NPC and its nonkeratinizing SCC subtype is a hallmark of endemic regions. A recent study on NPC characteristics in Indonesia using national health insurance data (2019-2022) also found a male predominance (68%), with a mean age of 50.5 years, and 59% aged 45-65 years, which closely mirrors our findings. The study also highlighted that 62% of patients resided in Java and 20% in Sumatra. Our study provides specific data for Bali.[15,16]

The high number of farmers among patients suggests a need for further investigation into agricultural exposures. Understanding local dietary habits in Bali, traditional food preparation methods, and prevalence of EBV infection and its genotypes could provide crucial clues to the high NPC burden. Educating the public and primary healthcare providers about the early signs and symptoms of HNC, particularly NPC (unilateral hearing loss, nasal obstruction or epistaxis, neck lump, persistent headache). Given the high incidence of NPC, which often presents at a late stage, screening strategies for high-risk individuals (based on family history, specific occupational exposures, or possibly EBV serology in the future) could be considered, although the feasibility and effectiveness of mass screening require careful evaluation. Nasoendoscopy should be readily available. While specific local risk factors need more detailed study, general advice on avoiding tobacco, moderating alcohol, and promoting a diet rich in fruits and vegetables remains important. If specific occupational or environmental carcinogens are identified, protective measures should be promoted. Ensuring timely referral from primary care to specialized ENT and oncology services for suspicious cases is crucial for improving treatment outcomes. This descriptive study lays the groundwork for more in-depth analytical studies, including case-control or cohort studies, to elucidate the specific etiological factors for the high NPC rates in Bali. Molecular studies investigating genetic susceptibility and EBV subtypes would also be valuable. The study relied on existing medical records, which may suffer from incomplete or inconsistently recorded information. Although efforts were made to include only complete records for the studied variables, nuances of clinical presentation or unrecorded risk factor data (like smoking, alcohol, family history, EBV status) were not available for analysis. The findings are from a single tertiary referral hospital. While it is the largest in Bali, it may not capture all HNC cases in the province, as some patients might seek treatment elsewhere or not at all. Thus, the results may not be fully generalizable

to the entire Balinese population, potentially reflecting referral bias for more complex or advanced cases.[17-20]

4. Conclusion

This retrospective study of 290 patients at Prof. Dr. I.G.N.G. Ngoerah General Hospital Denpasar from 2021 to 2023 revealed that head and neck malignancies in this Balinese cohort were most commonly found in males (69%), predominantly in the 45–65 year age group (63%), with farmers being the most frequently reported occupation (27%). The most significant finding was the exceptionally high prevalence of nasopharyngeal carcinoma, which constituted 80% of all head and neck malignancies. Consistent with this, nonkeratinizing squamous cell carcinoma was the dominant histopathological type (80%). These findings underscore that nasopharyngeal carcinoma represents a major and specific oncological challenge in Bali. The distinct epidemiological profile identified calls for heightened awareness, targeted early detection strategies, and further etiological research focusing on local risk factors, including genetic predisposition, Epstein-Barr virus infection, and environmental or occupational exposures associated with the Balinese lifestyle and common occupations such as farming. Prioritizing resources for NPC prevention, diagnosis, and treatment is crucial for reducing the HNC burden in this region. Further multi-center studies with more detailed risk factor assessment are warranted to build upon these findings and inform comprehensive cancer control planning in Bali.

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